

THE MINERAL INDUSTRY OF SUDAN

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In Sudan, rising production of gold and crude petroleum in recent years has increased substantially the mineral sector's influence on the national economy. Other mineral commodities produced included cement, chromite, gravel, gypsum, limestone, marble, mica, refined petroleum products, salt, construction sand, and silver. Sudan is also known to have deposits of barite, copper, iron ore, kyanite, lead, nickel, talc, tungsten, wollastonite, and zinc.

In 2003, Sudan's gross domestic product (GDP) based on purchasing power parity amounted to about \$68 billion. The GDP increased by 5.8% in 2003 after rising by 6% in 2002, 6.1% in 2001, and 6.9% in 2000. In 2002, the mining sector accounted for 9% of the GDP; manufacturing, 7.5%; building and construction, 4.7%; and electricity and water, 1.7% (International Monetary Fund, 2004, p. 194; 2004^{§1}; Bank of Sudan, undated, p. III.1).

Civil war and social strife in Sudan limited, to a large extent, investment in the mineral sector and other sectors of the economy. Sanctions by the United Nations in 1996 and the United States in 1997 set legal barriers to investment in the country and were followed by the Sudan Peace Act that was ratified by the Congress of the United States in 2002. The Sudan Peace Act aimed to block loans from international financial institutions if the Government of Sudan rejected negotiations with the Sudanese People's Liberation Army (SPLA). Revenues from petroleum sales, which allegedly were used to finance operations in the Sudan conflicts, constituted one of the reasons for promulgating the Act (U.S. Department of the Treasury, 2000; Africa Energy Intelligence, 2002).

In late December 2003, the Government signed an agreement with the SPLA to share the country's petroleum revenues. The Government and the SPLA planned to discuss power-sharing agreements and the status of disputed areas in central Sudan in January 2004 (Integrated Regional Information Networks, 2004).

Commodity Review

Metals

Chromium.—In 2003, Sudan's production of chromite increased to 47,000 metric tons (t) from 15,000 t in 2002. Higher output may have been attributable to rising world demand for stainless steel. Elneelain Works Co. produced 10,000 t in 2002, and Advanced Mining Works Co., 5,000 t. Advanced Mining company produced from several small-scale mines in the Ingessana Hills. These mines had resources of 2 million metric tons (Mt) of metallurgical-grade chromite

at a grade of 51% Cr₂O₃ (Scott, 2003; Geological Research Authority of the Sudan, undated b, p. 25).

Gold.—The Ariab Mining Company Ltd. (AMC) produced 5,239 kilograms (kg) of gold in 2002 (the last year for which data were available), which was a decrease from 5,417 kg in 2001 and 5,774 kg in 2000 (table 1). The company mined gold at the Baderuk, the Hadal Auatib, and the Oderuk deposits and held other concessions in Sudan. AMC planned to increase the mill capacity at Ariab to 1.2 million metric tons per year (Mt/yr) from 800,000 metric tons per year (t/yr). The increase in capacity would allow AMC to maintain gold production at 5,000 kilograms per year (kg/yr) (Compagnie Générale des Matières Nucléaires, 2003[§]).

Artisanal miners produced about 450 kg/yr of gold at Gugub in the Ingessana Hills area from 1997 to 2002. In July and September 2003, new discoveries of gold led to higher production. From 1997 to 2002, the nearly 700 kg/yr of mercury used in the production process was released into the environment. Other environmental problems included river siltation and deforestation (Ibrahim, 2003, p. 3, 10, 12).

In 2003, national gold exports were reported to be 7,784 kg at a value of \$58.6 million, or 2% of total exports. In addition to the gold produced and exported by AMC and Sudanese artisanal miners, some of Ethiopia's artisanal gold output was reported to be smuggled through Sudan (Bank of Sudan, 2003).

Iron and Steel.—Sudan Master Technology operated a meltshop and rolling mill in Giad Industrial City. In 2002, the production of iron bars at Giad Industrial City increased to 53,035 t compared with 42,785 t in 2001. Hafez el Barbary and Sudanese Malaysian Co. had a combined galvanized steel production capacity of 15,000 t/yr (Glasson, 2003; Bank of Sudan, undated, p. IV.10).

In 2002, Sudan's apparent consumption of finished steel amounted to 289,000 t, which was an increase from 211,000 t in 2001 and 55,000 t in 1997. In 2003, imports of iron and steel were 476,399 t at a value of \$224.7 million. Iron and steel accounted for 14% of Sudan's total imports (Bank of Sudan, 2003; International Iron and Steel Institute, 2004, p. 91).

Industrial Minerals

Cement.—The Atbara and the Rabak cement plants had a combined capacity of 500,000 t/yr. In 2002, production at Atbara rose to 154,300 t from 139,300 t in 2001, and production at Rabak fell to 41,000 t from 50,200 t. A joint venture of Advanced Technology of Sudan, ASEC Group of Egypt, Dan Fodio Company of Sudan, and Misr Sons Development of Egypt planned to build a new cement plant north of Khartoum. The plant was expected to have a capacity of 1.2 Mt/yr and to cost between \$160 million and \$180 million (Middle East Economic Digest, 2002; Bank of Sudan, undated, p. IV.15).

The International Cement Review (2003) forecasted that cement consumption would rise to 1 million metric tons (Mt)

¹References that include a section mark (§) are found in the Internet References Cited section.

in 2003 from 840,000 t in 2002 and 700,000 t in 2001. The majority of Sudan's cement requirements were imported from Jordan and Saudi Arabia.

Gypsum.—In 2002, Sudan produced 4,540 t of gypsum, compared with 2,422 t in 2001 and 13,808 t in 2000. Mousa Hassan Massar was the largest local producer and accounted for 1,392 t. In 2002, Sudan had 18 valid leases for gypsum. The number of producers increased to seven from four in 2001 (Geological Research Authority of the Sudan, undated a, p. 14, undated b, p. 24, 27).

Salt.—In 2002, Sudan had nine active salt-producing companies that produced 83,340 t of salt (table 1). Production at Sudanese Salt Co. fell to 40,916 t from 43,286 t in 2001. At Baaboud Salt Plant, output rose to 18,968 t from 14,859 t, and at other plants, to 23,456 t from 19,638 t. In 2002, Sudan had 31 valid leases for salt pans (Geological Research Authority of the Sudan, undated a, p. 14-15; undated b, p. 24, 26).

Stone, Dimension (Marble).—Sudan's output of marble rose to 22,000 square meters (m²) in 2002 from 15,500 m² in 2001. Makawi's Factory for Marble and Granite produced 11,500 m²; and Stones and Marbles Co., 10,500 m². Small amounts of Sudanese marble were exported. In 2002, Sudan had 495 valid quarrying leases for aggregates, clay, marble, and sand and gravel compared with 477 in 2001 (Geological Research Authority of the Sudan, undated a, p. 14, 16; undated b, p. 24-25).

Mineral Fuels

In 2003, Sudan's production of crude petroleum increased to nearly 110 million barrels (Mbbbl) from 87.76 Mbbbl in 2002 and 77.76 Mbbbl in 2001. Sudan accounted for 3% of African crude petroleum production in 2002. In 2003, petroleum reserves were no less than 2.4 billion barrels (Gbbbl).

The Greater Nile Petroleum Operating Company (GNPOC) [a joint venture of China National Petroleum Corp. (CNPC), Petronas Carigali Overseas Shd. Bhd. of Malaysia, ONGC Videsh Ltd. of India, and Sudan Petrol Co. (Sudapet)] held blocks 1, 2, and 4 in south-central Sudan. GNPOC produced from 90% to 95% of Sudan's crude petroleum from the Bamboo, el-Nar, the el-Toor, the Grand Heglig, the Khairat Northeast, the Tooma South, and the Unity oilfields in blocks 1A and 2A. In March 2003, ONGC Videsh purchased its share of GNPOC from Talisman Energy Inc. of Canada for \$758 million. Talisman estimated that reserves in blocks 1A and 2A were about 1.2 Gbbbl and those in block 4, 66 Mbbbl (Arab Petroleum Research Center, 2004).

Blocks 5A and 5B were located in the Muglad Basin. Block 5A was held by a consortium that consisted of Petronas Carigali Overseas of Malaysia, ONGC Videsh, and Sudapet. In April 2003, Lundin Petroleum AB of Sweden sold its share in block 5A to Petronas for \$142.5 million; block 5A had reserves of 149 Mbbbl. Block 5B was held by Petronas (41%), ONGC Videsh and Lundin (24.5% each), and Sudapet (10%). In 2003, operations in block 5B remained on hold because of security

concerns. ONGC Videsh purchased its shares in blocks 5A and 5B from OMV Aktiengesellschaft of Austria in 2003 (Africa Energy Intelligence, 2003c; Lundin Petroleum AB, 2003; 2004, p. 20).

Blocks 3 and 7 in eastern Sudan were held by the Petrodar consortium [CNPC (41%), Petronas (40%), Sudapet (8%), Gulf Petroleum Company of Qatar (6%), and Al Thani Group of Sudan (5%)]. The Adar-Yale field near Malakal produced small amounts of crude petroleum that were refined at El Obeid. Blocks 3 and 7 had reserves of 775 Mbbbl. CNPC, which was the operating company, expected to produce 170,000 barrels per day (bbl/d) in blocks 3 and 7 in the second half of 2005. Production could rise to 300,000 bbl/d in late 2006 or early 2007 (Middle East Economic Survey, 2003; Oil & Gas Journal, 2003).

CNPC held block 6, which was to the northwest of Muglad. Reserves in block 6 were reported to be 250 Mbbbl. CNPC expected to start production in block 6 during the first quarter of 2004. Production would start at an initial rate of 60,000 bbl/d before rising to 180,000 bbl/d (Middle East Economic Survey, 2003; Oil & Gas Journal, 2003; Ye, 2003).

In 2003, the Government awarded block 8 in eastern Sudan to Petronas; the company would operate in tandem with Sudapet and High Tech Group of Sudan. In October, the Government awarded block C to a joint venture of Cliveden Petroleum Co. of Great Britain, Sudapet, and the Government of Khartoum Province. The Government also awarded block 9 in eastern Sudan to Zafir Company of Pakistan. TotalFinaElf held the block B license. At the end of 2003, the Government was still offering data on blocks 12, 13, and 14 to companies for tender bids (Africa Energy Intelligence, 2003b-d; Oil & Gas Journal, 2003).

In 2003, exports of crude petroleum amounted to 72.4 Mbbbl at a value of \$1.93 billion compared with 62.2 Mbbbl at a value of \$1.4 billion in 2002. Crude petroleum accounted for 76% of the value of Sudan's exports in 2003. In January, Sudan started exporting crude petroleum to Ethiopia (Bank of Sudan, 2003; Oil & Gas Journal, 2003).

The Khartoum Oil Refinery had a capacity of 50,000 bbl/d in 2003. In August 2003, the Government awarded CNPC a contract to increase the refinery's capacity to 100,000 bbl/d; the upgrade was expected to cost \$340 million. In November, the Government awarded a contract to ONGC Videsh to increase the capacity of the Port Sudan Refinery to 90,000 bbl/d from 50,000 bbl/d; the upgrade was expected to cost \$300 million (Africa Energy Intelligence, 2003a, d, e). Sudan also had topping plants at Abu Jabra, El Obeid, and Sharjirah that produced mainly heavy fuel oil.

In 2003, exports of petroleum products amounted to \$113.7 million, or 4% of total exports. Imports of petroleum products were \$148.7 million in 2003 compared with \$132.3 million in 2002. Bahrain accounted for \$51.5 million of Sudan's imported petroleum products; Saudi Arabia, \$38 million; and the United Arab Emirates, \$31.6 million. Imports of petroleum products accounted for about 9% of Sudan's total imports (Bank of Sudan, 2003).

Infrastructure

Sudan suffered from shortages of electric power. In 2002, domestic production of electricity was 2,892.6 gigawatthours (GWh) compared with 3,093.5 GWh in 2001. Thermal power stations accounted for 56% of output in 2002, and hydroelectric plants, 44%. The state-owned National Electricity Corporation planned to increase capacity with the construction of the Merowe and the Kajbar Dams, which would add capacities of 1,000 megawatts (MW) and 300 MW, respectively. Construction on the Kajbar Dam was underway in 2003. The Merowe Dam was expected to be completed in 2008 (Arab Petroleum Research Center, 2004; Bank of Sudan, undated, p. IV.18).

The 1,610-kilometer (km) pipeline that ran from block 1A to Port Sudan had a capacity of 250,000 bbl/d. In August 2003, CNPC signed an agreement with the Government to build a 730-km crude petroleum pipeline from the block 6 oilfields to the Khartoum Oil Refinery. The pipeline would have a capacity of 200,000 bbl/d. In December, a consortium of Indian companies led by ONGC Videsh signed an agreement with the Government to build a new 740-km petroleum products pipeline from the Khartoum Oil Refinery to Port Sudan (Middle East Economic Survey, 2003; Arab Petroleum Research Center, 2004)

Outlook

The International Monetary Fund (2004, p. 194) has predicted that Sudan's GDP would rise by 6.2% in 2004 and 6.5% in 2005. High rates of GDP growth may lead to increased demand for such local construction materials as cement, gravel, limestone, marble, and sand. With the start of production in blocks 3, 6, and 7, Sudan's crude petroleum output is expected to rise to more than 600,000 bbl/d by the end of 2005 and to 750,000 bbl/d by the end of 2006 from 300,000 bbl/d in 2003. Plans to increase petroleum production depend upon political stability; the Government and the SPLA are expected to sign a comprehensive peace agreement in late January 2004. The separate conflict in Darfur, which contained part of block 6, remained unresolved at the end of 2003 (Integrated Regional Information Networks, 2003, 2004; Middle East Economic Survey, 2003).

References Cited

- Africa Energy Intelligence, 2002, Sudan—U.S. turns the screws: Africa Energy Intelligence, no. 332, October 23-November 6, p. 2.
Africa Energy Intelligence, 2003a, Africa—CNPC in refinery deals: Africa Energy Intelligence, no. 346, May 21-June 3, p. 3.
Africa Energy Intelligence, 2003b, Sudan—Cliveden lands acreage: Africa Energy Intelligence, no. 357, November 12-25, p. 5.

- Africa Energy Intelligence, 2003c, Sudan—Indians & Pakistanis in push: Africa Energy Intelligence, no. 352, September 3-16, p. 5.
Africa Energy Intelligence, 2003d, Sudan—Petronas & Chinese tighten grip: Africa Energy Intelligence, no. 352, September 3-16, p. 4-5.
Africa Energy Intelligence, 2003e, Sudan—Who controls Africa's refineries?: Africa Energy Intelligence, no. 356, October 29-November 11, p. 1.
Arab Petroleum Research Center, 2004, Sudan, *in* Arab oil & gas directory 2004: Paris, France, Arab Petroleum Research Center, p. 414-426.
Bank of Sudan, undated, Annual report 2003: Khartoum, Sudan, Bank of Sudan, 100 p.
Bank of Sudan, 2003, Foreign trade statistical digest: Khartoum, Sudan, Bank of Sudan, Fourth quarter, unpaginated.
Geological Research Authority of the Sudan, [undated]a, Annual report 2001: Khartoum, Sudan, Geological Research Authority of the Sudan, 48 p.
Geological Research Authority of the Sudan, [undated]b, Annual report 2002: Khartoum, Sudan, Geological Research Authority of the Sudan, 58 p.
Glasson, Victoria, 2003, Ethiopia takes Africa's galv capacity to 2.28 million tonnes: Metal Bulletin, no. 8812, October 20, p. 27.
Ibrahim, M.S., 2003, Information about Ingessana Hills artisanal gold mining sites chosen for the environmental and health assessment: Vienna, Austria, United Nations Industrial Development Organization, 15 p.
Integrated Regional Information Networks, 2003, Sudan—The escalating crisis in Darfur: New York, New York, Integrated Regional Information Networks press release, December 31, 4 p.
Integrated Regional Information Networks, 2004, Sudan—Gov't, rebels reach agreement on wealth sharing: New York, New York, Integrated Regional Information Networks press release, January 6, 1 p.
International Cement Review, 2003, Sudan, *in* The global cement report (5th ed): Dorking, United Kingdom, Tradeship Publications, Ltd., p. 293.
International Iron and Steel Institute, 2004, Steel statistical yearbook 2003: Brussels, Belgium, International Iron and Steel Institute, 111 p.
International Monetary Fund, 2004, World economic outlook—Advancing structural reforms: Washington, DC, International Monetary Fund, April, 275 p.
Lundin Petroleum AB, 2003, Lundin Petroleum sells interest in block 5A, Sudan to Petronas for USD 142.5 million: Stockholm, Sweden, Lundin Petroleum AB press release, April 28, 1 p.
Lundin Petroleum AB, 2004, Annual report 2003: Stockholm, Sweden, Lundin Petroleum AB, 64 p.
Middle East Economic Digest, 2002, News in brief—Sudan: Middle East Economic Digest, v. 46, no. 42, October 18, p. 19.
Middle East Economic Survey, 2003, Energy—Sudan: Middle East Economic Survey, v. 46, no. 48, December 1, p. A2-A3.
Oil & Gas Journal, 2003, Sudan could support growth as non-OPEC oil exporter: Oil & Gas Journal, v. 101, no. 41, October 27, p. 46-48.
Scott, Neil, 2003, Sudan in Mining annual review 2003: Mining Journal Ltd., CD-ROM.
U.S. Department of the Treasury, 2000, Treasury applies Sudan sanctions to joint oil venture: Washington, DC, U.S. Department of the Treasury press release, February 16, 1 p.
Ye, Xie, 2003, CNPC pumps money into Sudan: China Daily [Beijing, China], May 19, p. 6.

Internet References Cited

- Compagnie Générale des Matières Nucléaires, 2003, Worldwide mining operations, accessed June 8, 2004, via URL http://www.cogema.com/servlet/ContentServer?pagename=cogema_en/home.
International Monetary Fund, 2004 (April 21), Selected world aggregates, World Economic Outlook Database, accessed June 9, 2004, via <http://www.imf.org/external/pubs/ft/weo/2004/01/data/index.htm>.

TABLE 1
SUDAN: PRODUCTION OF MINERAL COMMODITIES^{1,2}

Commodity		1999	2000	2001	2002	2003 ^e
Cement, hydraulic	metric tons	230,600	145,800	189,500	195,300 ^r	320,000
Chromite, mine output, gross weight ³	do.	48,000	54,500 ^r	-- ^r	15,000 ^r	47,000 ⁴
Gold, mine output, Au content ⁵	kilograms	5,566	5,774	5,417	5,239 ^r	5,000
Gypsum	metric tons	11,144	13,808	2,422	4,540 ^r	4,600
Marble	cubic meters	NA	NA	15,500	22,000	22,000
Petroleum:						
Crude, including lease condensate	thousand 42-gallon barrels	17,120	67,152	77,755	87,759	110,000 ⁴
Refinery products:						
Liquefied petroleum gas	do.	--	1,656	2,493	2,792 ^r	2,800
Gasoline	do.	124	6,456	8,228 ^r	8,725 ^r	8,730
Naptha	do.	--	--	198 ^r	303 ^r	310
Jet fuel	do.	--	--	910	1,339 ^r	1,340
Kerosene	do.	334	250	230 ^r	259 ^r	260
Distillate fuel oil	do.	--	--	6,282	6,599	6,600
Residual fuel oil	do.	1,056 ^r	4,160	1,656 ^r	1,991 ^r	2,000
Total	do.	1,514	12,522	19,997 ^r	22,008 ^r	22,000
Salt	metric tons	117,148	86,599 ^r	77,783	83,340 ^r	84,000
Silver	kilograms	NA	NA	1,598	3,256	3,300

^eEstimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. ^rRevised. NA Not available. -- Zero.

¹Includes data available through August 3, 2004.

²In addition to the commodities listed, the following are presumably produced although available information is inadequate to estimate output: clay and/or shale for cement manufacture (normally about 0.4 metric ton of clay and/or shale per metric ton of finished cement); limestone for cement manufacture (normally at least 1.25 metric tons per metric ton of finished cement), agriculture, lime manufacture, and construction aggregate and fill; and other construction materials (clays, sand and gravel, stone, and others for local use).

³Presumed to be ores and concentrates with an estimated average grade of about 51% chromic oxide.

⁴Reported figure.

⁵Does not include artisanal output.

TABLE 2
SUDAN: STRUCTURE OF THE MINERAL INDUSTRY IN 2003

(Metric tons unless otherwise specified)

Commodity		Major operating companies	Location of main facilities	Annual capacity
Cement		Atbara Cement Company Ltd. (LaFarge Group of France and Dal Group of Sudan)	Atbara	400,000.
Do.		Nile Cement Company (Government, 100%)	Rabak	100,000.
Chromite		Ingessana Hills Mines Corp.	Ingessana Hills	48,000.
Do.		Elneelain Works Co.	NA	NA.
Gold	kilograms	Compagnie Miniere Or (Government of Sudan, 60%, and Ariab Mining Company, 40%)	Ariab	5,000.
Gypsum		Sudanese Mining Corp. (Government, 100%)	Bir Eit Mine	15,000.
Limestone		Atbara Cement Company Ltd.	Atbara	500,000.
Do.		Nile Cement Company	Rabak	200,000.
Marble		Makawi's Factory for Marble and Granite	NA	NA.
Do.		Stones & Marbles Co.	NA	NA.
Do.		Al Masarra Co. Ltd.	Atbara and El Jebelein ¹	NA.
Do.		Imtco Mining Co.	Synkat ¹	NA.
Mica		Sudanese Mining Corp. (Government, 100%)	Sheriek Mines	1,800.
Petroleum:				
Crude	thousand 42-gallon barrels	Greater Nile Petroleum Operating Co. [China National Petroleum Corp. (CNPC), 40%; Petronas Carigali Overseas Shd. Bhd., 30%; ONGC Videsh Ltd., 25%; National Petroleum Co. of Sudan (Sudapet), 5%]	Block 1, Unity, El Toor, and Tooma South Fields; Block 1a, Munga and Khairat Fields; Block 2, Grand Heglig Field (Heglig, Barki, Hamra, Kanga Laloba, Rihan, and Toma Fields); Block 2a, Bamboo and Garaad Fields	104,000.
Do.	do.	Petrodar Consortium (China National Petroleum Corp., 41%; Petronas, 40%; Sudapet, 8%; Gulf Petroleum Company of Qatar, 6%; Al-Thani Group, 5%)	Block 3, Adar-Yale Field	3,650.
Do.	do.	China National Petroleum Corp.	Block 6, Abu Gabra, Sharaf, and Tabaldi Fields	730.
Refined	do.	Khartoum Oil Refinery (China National Petroleum Corp., 50%, and Sudan Petroleum Corp., 50%)	Jali	1,515 liquefied petroleum gas; 7,428 gasoline; 1,569 kerosene; 7,738 diesel fuel.
Do.	do.	Port Sudan Refining Ltd. (Government, 100%)	Port Sudan	93 liquefied petroleum gas; 1,014 gasoline; 898 kerosene; 2,499 diesel fuel; 4,154 residual fuel oil; 458 naptha.
Do.	do.	Government	El Obeid	3,650.
Do.	do.	Concorp Ltd.	Shajirah	3,650.
Do.	do.	Government	Abu Jabra	730.
Steel:				
Crude		Sudan Master Technology	Giad Industrial City	60,000.
Rebar		do.	do.	150,000.
Galvanized		Sudanese Malaysian Co.	NA	8,000.
Do.		Hafez El Barbary	NA	7,000.

NA Not available.

¹Out of operation since 2001.